PALCO Labs, Inc.

Service Guide for the 300 Series Pulse Oximeter

NOTE: THIS DOCUMENT CONTAINS CONFIDENTIAL AND/OR PROPRIETARY INFORMATION AND IS NOT TO BE REPRODUCED, DISTRIBUTED OR DISCLOSED TO ANOTHER PARTY WITHOUT PRIOR WRITTEN APPROVAL OF PALCO LABS, INC. OR ITS DESIGNATED AGENT.

Australian Distributor:

MEDICAL DEVICES Pty Ltd
14 / 103 Majors Bay Road Concord
P.O. Box 255 Concord
New South Wales 2137 Australia
Tel: (02) 9743 3888
Fax: (02) 9743 3999

HZ

1

8030 Soquel Avenue, Santa Cruz, CA 95062-2032
PHONE 408/476-3151 • 800/346-4488 • FAX 408/476-1114

TABLE OF CONTENTS

Section 1 - INTRODUCTION

Section 2 - LIMITATIONS TO SERVICING

Section 3 - MANDATORY WORKING ENVIRONMENT

Section 4 - REPLACEMENT ITEMS

Section 5 - INSTRUCTIONS FOR SERVICING THE 300 SERIES PULSE OXIMETER

5.1. Preparation for Utilizing this Section

5.2. Opening and Closing the Case

5.2.1. Opening the Case

5.2.2. Closing the Case

5.3. Board Replacement

5.3.1. Main Board

5.3.2. Option Board (Models 340 and 340-Vet only)

5.4. Case Replacement

5.4.1. Upper Case

5.4.2. Lower Case

5.5. Component Replacement

5.5.1. Red Lens

5.5.2. Keypad

5.5.3. Socketed Parts

5.5.3.1. Seven-Segment Display LEDs (Socketed only)

5.5.3.2. MPU Chips and PIC Chips (Socketed only)

5.5.3.3. Fuses (Socketed only)

5.5.4. Speaker (Models 340 and 340-Vet only)

5.5.5. Battery Pack (Models 305, 340, and 340-Vet only)

5.5.6. Battery Clips (Model 300 only)

Section 6 - CLEANING INSTRUCTIONS

Section 7 - PALCO PRODUCT SUPPORT

7.1. Warranty Information

7.2. What PALCO Will Do to Correct Problems

7.3. Satellite Service Centers

Section 1. - INTRODUCTION

This Service Guide is designed to provide authorized PALCO service technicians with instructions on proper servicing of PALCO's 300 series of pulse oximeter. It details the correct procedures for opening the instrument, replacing certain components permitted by PALCO, and reassembling the unit.

This Service Guide should be used in conjunction with the appropriate version of the User's Manual available for each model of oximeter. The User's Manual furnishes important information not printed in this document, such as descriptions of controls, indicators, and other features, explanations of the user-run assurance tests, and a listing of possible problems and solutions.

The procedures and documentation described herein are to be utilized in accordance with any and all agreements or contracts established between PALCO Labs and the Service Center.

Section 2. - LIMITATIONS TO SERVICING

The basic principles to which the Authorized PALCO Service Center must agree are the following:

- The primary function of the Service Center is to identify the problem occurring in the equipment.
- The secondary function of the Service Center is to **replace** components which have been identified as defective. These items may be replaced, not repaired.

  Replaceable components are such items as batteries, plastic cases, and keypads. A list is included later in this document.
- The Service Center will not at anytime attempt to repair any part on the printed circuit boards (PCBs). Schematic drawings will not be made available, and **any attempt to perform repairs on a PCB will void all warranties.**
- The Authorized Service Center must complete and return to PALCO a completed Service Technician's Report for any repair to a PALCO pulse oximeter.
- Failure to comply with any or all limitations may result in revocation of authorization.

Section 3. - MANDATORY WORKING ENVIRONMENT

As part of the agreement between PALCO and the Service Center, the Service Center pledges that it will maintain a servicing work environment which will have the following:

- a clean anti-static workstation
- adequate lighting
- variable voltage DC power supply with amp meter
- multimeter
- appropriate User's Manuals for the PALCO pulse oximeters to be serviced
- a PALCO tamper-proof tool (provided by PALCO)
- regular and Phillips head screwdrivers
- 44 pin PLCC chip extractor tool

Section 4. - LIST OF REPLACEMENT ITEMS

The following is a list of all items which the Authorized Service Center may replace in the PALCO 300 Series Pulse Oximeter.

- battery packs
- battery clips
- complete printed circuit boards
- keypads
- labels
- plastic cases
- red lenses
- socketed fuses
- socketed PIC chips
- socketed MPU/ROM chips
- socketed seven-segment LEDs
- speakers

Section 5. - INSTRUCTIONS FOR SERVICING THE 300 SERIES PULSE OXIMETER

5.1. PREPARATION FOR UTILIZING THIS SECTION

The following subsections detail the correct procedures for disassembling and reassembling the PALCO 300 Series Pulse Oximeter. Step-by-step descriptions are given on how to open the case, remove the printed circuit boards, install new components, reassemble the oximeter, and close the case.

For the safety of the participant and for the protection of the equipment, PALCO has required that the working environment described in the section of this Guide titled, "Mandatory Working Environment" be established before servicing begins.

Proceed with the steps in each section in the order in which they are presented. Always read each section completely before beginning the servicing procedure. If you have any questions or difficulties, please contact PALCO Labs.

WARNING: THE PROCEDURES THAT FOLLOW ARE NOT INTENDED TO BE USED AS REPAIR INSTRUCTIONS. DO NOT ATTEMPT TO REPAIR THE OXIMETER WITHOUT PROPER AUTHORIZATION AND DOCUMENTATION FROM PALCO LABS.

CAUTIONS:

- Before performing the following procedures, disconnect all power supplies and peripheral devices from the oximeter, for example: AC adapter; batteries *(Model 300 only)*; or sensors.
- Adhere to all safety cautions and warnings listed in this manual.
- Do not deviate from these instructions in an attempt to further remove or replace any component.
- Do not perform the procedures until you are grounded (strapped to the anti-static station) to protect the electronic components inside the oximeter.

NOTE: Assembly is the reverse of disassembly, unless otherwise specified.

5.2. OPENING AND CLOSING THE CASE

5.2.1. Opening the Case

a) Lay the unit face down and remove the four case screws.

b) Turn the unit face up and lift the upper case about one inch apart from the lower case, and disconnect the keypad connector from the main board. The case halves can now be laid open side-by-side.

c) ***Models 340 and 340-Vet only:*** If it is necessary to further separate the case halves, lift the main board straight up from the lower case (this will disconnect it from the option board), and unplug the speaker from the option board.

5.2.2. Closing the Case

a) ***Models 340 and 340-Vet Only:*** Plug in the speaker

All Units:

b) Confirm that all LEDs are vertical, not bent to the side, and that the LED windows in the keypad are not obstructed. Also confirm that the wires under the main board are routed properly.

c) Place the upper case about one inch above the lower case and connect the keypad to the main board. Lower the upper case into place: it should seat without being forced.

d) Lay the unit face down and place the four case screws into the four holes. (To avoid crossthreading, turn the screws counterclockwise until the screw drops into the threads.) Tighten the four screws.

5.3. BOARD REPLACEMENT

5.3.1. Main Board

Removal:

a) Open the case (section 5.2.1.).

b) Then:

Models 300 and 305: Lift the main board straight up about two inches and unplug it from the battery connector (Model 300) or battery pack connector (Model 305). Lay the board down next to the case.

Model 300 - older units only: Lift the main board and lay it down next to the case. Remove the batteries. Unsolder the yellow (+) and black (-) wires at the two battery clips, noting their position (polarity). **Do not unsolder them at the board.**

Models 340 and 340-Vet: Lift the main board straight up (this will disconnect it from the option board), then disconnect the battery pack. Lay the board next to the case.

Installation:

a) ***Model 300 only*:** Plug the main board to the battery connector. Place the main board straight down into the lower case using the case screw holes to visually align it. Be sure that the battery wires are not pinched and that they are routed properly.

Model 300 - older units only: After checking that the wires are properly stripped and tinned, solder the yellow (+) and the black (-) wires to the appropriate single battery clips according to the polarity noted previously. Then place the main board straight down using the case screw holes to visually align it. Be sure that the battery wires are not pinched and that they are routed properly.

***Model 305 only*:** Plug in the battery pack, then place the main board straight down using the case screw holes to visually align it. Be sure that the battery wires are not pinched and that they are routed properly.

***Models 340 and 340-Vet only*:** Plug in the battery pack to the main board. Place the main board straight down using the case screw holes to visually align it. Be sure that the battery wires and the speaker wires are routed properly and are not pinched.

b) Close the case (section 5.2.2.).

5.3.2. Option Board (*Models 340 and 340-Vet only)*

Removal:

a) Open the case (section 5.2.1.)

b) Remove the main board (section 5.3.1).

c) Unplug the speaker from the option board.

d) Unscrew the single retaining screw to release the option board. The option board can now be lifted out of the case.

Installation:

a) Place the option board in the bottom case and secure it to the case using the retaining screw.

b) Plug the speaker to the option board.

5.4. CASE REPLACEMENT

5.4.1. Upper Case

Removal:

a) Open the case (section 5.2.1.).

b) ***Models 340 and 340-Vet only:*** Remove the main board (section 5.3.1.), then disconnect the speaker from the option board and remove the speaker (section 5.5.4.). Also, if the red lens assembly (red lens, light tube, and component shield) will be reused in the new case, remove them (see Section 5.5.1.).

Installation:

a) ***Model 300 or 305:*** First ensure that the light tube under the keypad has been installed and that the speaker cover has been installed and glued into the upper case.

Models 340 and 340-Vet: First check to be sure that the six light tubes have been installed under the keypad in the new upper case.

Install a new keypad (section 5.5.2.) and the red lens assembly (section 5.5.1.) into the new upper case.

b) ***Models 340 and 340-Vet only:*** also install the speaker assembly (section 5.5.4.), then connect the speaker to the option board. Reinstall the main board (section 5.3.1.).

c) Close the case (section 5.2.2.)

d) Attach the new model number label to the appropriate section of the lower outside of the case.

5.4.2. Lower Case

Removal:

a) Open the case (section 5.2.1.).

b) Remove the main board (section 5.3.1.).

c) ***Model 300 - newer and older models:*** Remove the batteries, then unsolder the yellow (+) and black (-) wires at the two battery clips, noting their position (polarity).

Model 305: also remove the battery pack (section 5.5.5.).

Models 340 and 340-Vet only: also remove the battery pack (section 5.5.5.) and the option board (section 5.3.2.).

Installation:

a) ***Model 300 only:*** Install the battery clips (section 5.5.6.). After checking that the wires are properly stripped and tinned, solder the yellow (+) and the black (-) wires to the appropriate single battery clips according to the polarity noted previously.

Models 305: Install the battery pack (section 5.5.5.).

Models 340 and 340-Vet only: Install the battery pack (section 5.5.5.). Install the option board (section 5.3.2.), then connect the speaker to the option board.

b) Install the main board into the new lower case (section 5.3.1.).

c) Close the case (section 5.2.2.).

d) Apply the three labels (instruction label; sensor, etc. information label; and serial number label) to the lower case.

5.5. COMPONENT REPLACEMENT

5.5.1. Red Lens

Removal:

a) Open the case (section 5.2.1.)

b) ***Models 340 and 340-Vet only:*** Remove the main board (section 5.3.1.), then disconnect the speaker from the option board.

c) With the upper and lower cases separated, take the upper case in hand and press the red lens assembly out of the case with your thumbs, one side at a time (the component shield and light tube should come out with the lens).

Installation:

a) With the upper case lying face up, press the pins of the red lens assembly, one side at a time, into the upper case. Be sure that the lens is seated completely and that the component shield is still intact.

b) ***Models 340 and 340-Vet only:*** Plug the speaker into the option board, then reinstall the main board (section 5.3.1.).

5.5.2. Keypad

Removal:

a) Open the case (section 5.2.1.)

Models 340 and 340-Vet only: lift up the main board and disconnect the speaker from the option board.

b) Use an awl or similar tool to lift up one upper corner of the keypad, being careful to lift all keypad layers together and to avoid scratching the exposed portion of the upper case. Grasp the corner of the keypad and peel it off of the upper case.

Installation:

a) Ensure that the surface of the upper case where the keypad will attach is clean.

b) Remove all backing pieces from the new keypad.

c) Feed the ribbon cable into the slot in the upper case.

d) Align one side (upper or lower) of the keypad with the recessed edge of the upper case, then seat the keypad onto the case, making sure that the ribbon cable is not pinched.

e) Close the case (section 5.2.2.)

5.5.3. Socketed Parts

In some models, the seven-segment displays, MPU chips, PIC chips, and/or fuses may be socketed, not soldered onto the board. These parts may, therefore, be replaced as indicated below.

5.5.3.1. Seven-Segment Display LEDs (Socketed only)

Removal:

a) Open the case (section 5.2.1.).

b) Remove the faulty seven-segment displays from the main board.

Installation:

a) Carefully press each seven-segment display straight down into its socket, ensuring that each of the pins seat without folding. Ensure that the new displays mount flush to the sockets and that they align with each other.

b) Close the case (section 5.2.2.).

5.5.3.2. MPU Chips and PIC Chips (Socketed only)

Note: Any upgrade of an MPU or PIC chip will require an amendment to the oximeter's serial number. Refer to the documentation accompanying the upgrade part.

Removal:

a) Open the case (section 5.2.1.).

b) Remove the main board (section 5.3.1.).

Model 300 - older models: do not unsolder battery wires for this procedure.

c) After noting the orientation of pin 1 on the chip, carefully remove the chip from the main board using a 44 pin PLCC chip extractor tool. Be sure to pull it straight up and out of the socket. Inspect the socket for broken plastic tabs or bent pins; remove any debris.

Installation:

a) Remove the new chip from its anti-static container and place it over the socket, making sure to align pin 1 of the chip with pin 1 of the socket. The chip should lay flat with all the pins contacting the socket pins before proceeding.

b) Grasp the board and place your thumb over the chip. Use a squeezing action with the thumb and index fingers on opposite sides of the board to seat the chip completely. Do not press the board onto the table as this will bend the board excessively.

c) Reinstall the main board (section 5.3.1.).

d) Close the case (section 5.2.2.).

5.5.3.3. Fuses (Socketed only)

Removal:

a) Open the case (section 5.2.1.).

b) Remove the faulty fuse(s) from the fuse holder(s) on the main board.

Installation:

a) Install the replacement fuse into the socket.
Caution: *Use only PALCO replacement fuses of the same value as the original.*

b) Close the case (section 5.2.2.).

5.5.4. Speaker *(Models 340 and 340-Vet only)*

Removal:

a) Open the case (section 5.2.1.).

b) Lift up the main board to unplug the speaker from the option board.

c) Using a light amount of force, pry up the speaker frame in several spots until the speaker is free.

Installation:

a) After verifying that the speaker recess is free from glue debris and that the replacement speaker frame is flat, lay the speaker flat in the upper case. The wiring should be pointing toward 3 o'clock).

b) Apply Super Glue or equivalent adhesive around the perimeter of the speaker frame so that it reaches the inside of the speaker hole recess in the upper case. Be careful not to get glue on the speaker itself.

c) Lift up the main board to plug the speaker to the option board.

d) Close the case (section 5.2.2.).

5.5.5. Battery Pack (Models 305, 340, and 340-Vet only)

Removal:

a) Open the case (section 5.2.1.)

b) Remove the main board (section 5.3.1.). Since correct orientation of the battery pack is essential, be sure to note the orientation of the battery pack and the routing of the wires before lifting out the battery pack.

Installation:

a) After ensuring that the five special bumper pads are installed and in the proper place on the battery pack, insert and orient the battery pack and wires according to the orientation noted during removal.

b) Reinstall the main board (section 5.3.1.).

5.5.6. Battery Clips (*Model 300 only*)

- **Double Battery Clips**

Removal:

a) Open the case (section 5.2.1.)

b) Remove the main board (section 5.3.1.).

c) Remove all the pieces of broken or damaged battery clips that may be within the case.

d) Pop out the old clips with a flat-blade screwdriver.

Installation:

a) Lay the lower case face down so that the battery compartment is accessible.

b) Place new battery clips into position with your fingers.

c) Using a standard screwdriver, press one side of the clip straight down into place, then press the other side of the clip into place.

d) Insert the batteries.

e) Verify that the clips exert enough force to prevent the batteries from falling out of place when the battery door cover is not installed. Adjust the tension as needed.

- **Single Battery Clips**

Removal:

a) Remove the batteries, then unsolder the yellow (+) and black (-) wires at the two battery clips, noting their position (polarity).

b) Pop out the old clips with a flat-blade screwdriver.

Installation:

a) Lay the lower case face down so that the battery compartment is accessible.

b) Place new battery clips into position with your fingers.

c) Using a standard screwdriver, press the clip straight down into place.

d) After checking that the wires are properly stripped and tinned, solder the yellow (+) and the black (-) wires to the appropriate single battery clips according to the polarity noted previously.

e) Insert the batteries.

f) Verify that the clips exert enough force to prevent the batteries from falling out of place when the battery door cover is not installed. Adjust the tension as needed.

Section 6. - CLEANING INSTRUCTIONS

PALCO pulse oximeters can be wiped clean with isopropyl alcohol or a detergent solution. Avoid caustic or abrasive cleaners that will mar the enclosure or key pad. Use extra care in cleaning the red display window to avoid scratching the finish.

CAUTION: DO NOT immerse the Oximeter in water or other liquids.
DO NOT allow any liquid to enter the enclosure.
DO NOT clean the Oximeter while it is in operation.

Section 7. - PALCO PRODUCT SUPPORT

7.1. WARRANTY INFORMATION

PLEASE NOTE: THIS PRODUCT IS MANUFACTURED AND SOLD BY PALCO LABS, INC. (herein after referred to as PALCO) UNDER THE WARRANTIES SET FORTH BELOW.

Applicability of Warranty: This warranty covers only the PALCO Pulse Oximeter and accessories as indicated. It is not extended to other products or components that the customer uses in conjunction with PALCO products. This warranty shall not apply if the manufacturer determines that the product has been damaged due to abuse, misuse, misapplication, accident, negligence, tampering, or as a result of service or modification by any other than an authorized PALCO service technician. Opening of the sealed enclosure or alteration of the serial number will void the warranty. Use of equipment contrary to or inconsistent with the *User's Manual* will also void the warranty.

What is Covered by this Warranty: PALCO warrants that the PALCO product enclosed with this warranty will conform to the manufacturer's specifications and shall be free from defects in workmanship and materials for a period of five (5) years from the date of original purchase. Items excluded from this five-year term are batteries, sensors, sensor extension cables, and AC adapters.

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, WHICH EXTEND BEYOND THE WARRANTIES SET FORTH ABOVE. PALCO MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT OR PARTS THEREOF. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY HAVE OTHER LEGAL RIGHTS WHICH VERY FROM STATE TO STATE. PALCO WILL NOT BE LIABLE TO THE USER FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE OF LOSS ARISING OUT OF THE USER'S INABILITY TO USE THIS PRODUCT.

7.2. WHAT PALCO WILL DO TO CORRECT PROBLEMS

Always read the *User's Manual* carefully. The information included in the *User's Manual* will assist you in preventing equipment misuse and ensuring patient safety. Operation of the equipment in a manner contrary or inconsistent with the *User's Manual* will void the warranty.

Should your PALCO product prove to be defective, contact PALCO Labs, Inc. by telephone at 1-800-346-4488. Please have your model and serial numbers available when calling. PALCO will then issue a return authorization number (RAN).
Return your defective instrument securely packaged in its original shipping carton (or equivalent packaging), and include the RAN. For repairs, mail to: PALCO Labs, Inc., Returns Department, 340D El Pueblo Drive, Scotts Valley, CA 95066. PALCO will repair any faulty workmanship and either repair or replace at our option any defective part with new or refurbished parts. If necessary, PALCO will send you a loaner instrument while your unit is being repaired. For non-

warranty repairs, the customer will be charged the current repair rate at time of receipt by PALCO and all transportation charges shall be the customer's responsibility.

PALCO shall not be liable for any damages including, but not limited to, incidental damages, consequential damages or special damages. This warranty does not cover any damage done to the equipment during shipping, which shall be the sole responsibility of the transportation company.

7.3. SATELLITE SERVICE CENTERS

To become a pulse oximeter servicing center, the facility must fulfill the requirements established by PALCO. These requirements are stated in the *Service Center Policies* document. Contact PALCO for further information.